AVIATION RULEMAKING ADVISORY COMMITTEE (ARAC)

Noise Certification Issues

Meeting Minutes

Date: October 29, 1998
Time: 10:00 a.m.
Place: General Aviation Manufactures Association (GAMA), 1400 K Street, NW, Suite 801, Washington, DC

The Assistant Chair, Mr. David A. Hilton of Gulfstream Aerospace Corporation, called the meeting to order at 10:00 a.m. An agenda was distributed (Attachment 1) and an attendance sheet was circulated (Attachment 2). Mr. Paul R. Dykeman, Assistant Executive Director, read instructions governing the conduct of the meeting.

Mr. Hilton welcomed everyone and introduced Mr. Chuck Sekyra, Co-chair of the Subsonic Transport Working Group and asked that introductions be made of the others in attendance.

Subsonic Transport Category Large Airplanes and Subsonic Turbojet Powered Airplanes Harmonization Working Group Mr. Sekyra (Boeing) gave a status of the working group and distributed the report listing the summaries of the issues resolved (Attachment 3) and a copy of the change pages from the proposed NPRM (Attachment 4) that resulted from the September WG meeting. Mr. Jim Skalecky (FAA) stated that legal may want to be involved with the ongoing Part 25 change. The rule change with Part 25 is incorporating 1 G stall speed. This WG proposal is incorporating the 1 G stall speed requirement in anticipation of the Part 25 rule change. Mr. Dykeman asked where is the requirement in the JAR and it was stated that it is identified in JAR 36 and that it has been in Annex 16 for a period of time. The requirement will also be placed in JAR 25.

Mr. Skalecky wanted them to know that at the September 1998 Transport WG meeting all issues were resolved with the exception of two differences. In Mr. Skalecky's judgement, only one of the two unresolved differences was likely to result in a change to part 36. His question to Mr. Dykeman is whether the WG should wait to resolve the wind speed issue. He was told that if it appears that it will take an extended time to resolve then it can be addressed in the Helicopters WG proposal.

Mr. Dykeman clarified that the changes recommended reflect the measurement techniques for noise and has no reflection on the noise levels. Mr. Ken Jones (FAA) brought to the Issues Group attention that the Helicopter WG needs the opportunity to review and coordinate on the changes recommended by the Turbojet Powered Airplanes WG. Mr. Dykeman suggested that the Helicopter WG coordinate with the Turbojet WG to ensure that both WG's concerns are addressed. Mr. Hilton asked if there were any

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other comments on the recommended changes to the proposed NPRM. Everyone in attendance agreed to the changes that had been identified.

Helicopters Harmonization Working Group: Mr. Charlie Cox (Bell) distributed a status report (Attachment 5) that outlined the milestones for the WG. Their goal is to have a WG approved document mailed to ARAC on December 18 for their review. The next Issues meeting is scheduled for January 14, 1999.

Mr. Hilton stated that the Propeller-Driven Small Airplanes NPRM is in the final FAA in-house review process and should be released for public comment very soon. The meeting was adjourned at 10:45 a.m.

Attendance

11 people, including committee members, alternates, and government employees, attended the October 29, 1998 meeting of the Noise Certification Issues Group of the Aviation Rulemaking Advisory Committee.

Public Notification

An announcement of the meeting was published in the Federal Register on October 14, 1998 (63 55173).

Approval

I certify that the above minutes are accurate.

Mr. David A. Hilton
Assistant Chair for ARAC Noise Certification Issues

Issued: DEC 16 1998

5 Attachments

FEDERAL AVIATION ADMINISTRATION

Aviation Rulemaking Advisory Committee Meeting on
NOISE CERTIFICATION ISSUES
10:00 a.m. October 29, 1998
General Aviation Manufactures Association
Suite 801
1400 K Street, NW
Washington, DC 20005

AGENDA

10:00	Opening remarks	Chairman
10:05	FACA Statement	Assistant Executive Director
10:06	Report on Status of Subsonic Transport Working Group	Subsonic Transport WG Co-Chair
10:10	Discussion of Status Report	ARAC Issue Group
10:15	Schedule next meeting date/place	Chairman
10:25	Closing Remarks	Chairman
10:30	Adjourn	

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Attachment (1)

AVIATION RULEMAKING ADVISORY COMMITTEE

Noise Certification Issues
October 29, 1998

ATTENDANCE

MEMBER (M) NON-MEMBER (N)	NAME	AFFILIATION	TELEPHONE/ FAX NUMBER	ELECTRONIC MAIL ADDRESS
M	Chuck Sckyra	Boeing	425-237-5011	Charles.A.Sakyra@boeing.com
M	Charles Cox	Bell	817-280-5600/4973	ccox@bellhelicopter.textron.c
M	Scott Shrum	NOISE	202-434-8163 202-639-8238	shrumsw@locklaw.com
N	KEN JONES	FAA	202-267-3568 .5594	KENNETH.JONES@FAA.GOV
N	Arlene Rockenbeck	The Regulatory Group	202-628-1408 628-3414	TRGroup-Inc@Compuserve.com
N	Karen Petronis	FAA - AGC	202-267-3073	Karen.Petronis@faa.gov
N	Jim Skalecky	FAA/AEE	202-267-3699/-5594	james.skalecky@faa.gov
N	Angela Anderson	FAA/AEM	202-267-4491/5075	angela.anderson@faa.gov
M	Paul Dykeman	FAA	202 267 3577/5594	Paul.Dykeman@FAA.GOV
M	D.A. Hilton	Gulfstream Aerospace	[redacted] 912 965 3106 4 4 3367 FAX	
M	Betty Ann Kane	NOISE	202 546-9062 ph 202 547 9558 fx	bettyannkane@sprintmail.com

Noise Cert Issues Working Group

Summary
Proposed Changes to NPRM - 10/29/98
(Issues Addressed at Paris HWG Meetings, 9/15 & 9/16/98)

Paper/ Item #	P36	J36/A16	Difference/Issue	Disposition 9/16/98 (NPRM Location for Chg.)
#15	A36.3(f)	App2, 3.5.6	Ambient noise measurement/adjustments	Resolved; HWG paper okay; ICCAIA prepare WG1 paper proposing change to A16; add change to NPRM **(B36.3.10)**.
#9	A36.5	App2, 5.2.5(j)	Reporting - non standard equipment (clarification)	Resolved; HWG paper modified; ICCAIA prepare WG1 paper proposing change to A16; add change to NPRM **(B36.5.2.5(j)).**
#11	B36.5(n)	App2, 4.4.2	Tone band sharing test	Resolved; HWG paper ok; Change A16; ICCAIA prepare WG1 paper; reflect change in NPRM **(B36.4.4.2)**
#13	B36.9	App2, 4.5.2, 4.5.4, 6.0	Duration determination - Change 1.0 sec to 0.5 sec?	Resolved; HWG paper ok; Change A16; ICCAIA prepare WG1 paper; reflect change in NPRM **(B36.4.5.2, 4.5.4, B36.6)**
#4	C36.7(b)(iv)	Ch3, 3.6.2.1(a)	Cutback height limit for Large Props @1000 ft (not in A16)	Resolved; adopt A16. Change NPRM **(C36.7(b)(1)(i)).**

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Summary
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(Issues Addressed at Paris HWG Meetings, 9/15 & 9/16/98)

Paper/ Item #	P36	J36/A16	Difference/Issue	Disposition 9/16/98 (NPRM Location for Chg.)
#16	C36.7(e)(3)	Ch3, 3.6.1.5	Runway gradient equal to zero (not specified in A16)	Resolved; change A16; HWG paper modified; ICCAIA prepare WG1 paper to add as 3.6.1.5(e). Change NPRM **(C36.7(a)(3),C36.7(a)(5)).**
#75(a) (orig.list)	C36.7(e)(1) NPRM	Ch3, 3.6.2.1(d)	Takeoff reference speed	Resolved; adopt A16. Change **(C36.7(b)(1)(iv)).**
#5	C36.9(e)	Ch3, 3.6.3(b)	Approach reference speed	Resolved; HWG agreed to FAA proposal. ICCAIA prepare WG1 paper to change A16; change NPRM **(C36.7(c)(1)(ii)).**

taken from manufacturer's data. In addition the insertion loss of the windscreen may be determined by a method traceable to a national standards laboratory within 6 months of each test series and tolerable changes in the insertion loss from the previous calibration at each one-third-octave frequency band shall be not more than 0.4 dB. The correction for the free-field insertion loss of the windscreen shall be reported to the certificating authority and applied to the measured one-third octave sound pressure levels determined from the output of the analyser.

~~B36.3.10 Ambient Noise Considerations (TBD)~~

~~(Text to be added from existing Part 36 or harmonized text from Annex 16/Part36.)~~

B36.3.10 *Adjustments for Ambient Noise*

B36.3.10.1 The ambient noise, including both acoustical background and electrical noise of the measurement system, shall be recorded (for at least 10s) at the measurement points with the system gain set at the levels used for the aircraft noise measurements, at appropriate times during each test day. The ambient noise shall be representative of the acoustical background that exists during the flyover test run. The recorded aircraft noise data shall be accepted only if the ambient noise levels when analysed in the same way and quoted in PNL (see B36.4.1.3 (a)) are at least 20 dB below the maximum PNL of the aircraft.

B36.3.10.2 Aircraft sound pressure levels within the 10 dB-down points (see B36.4.5.1) shall exceed the mean ambient noise levels determined above by at least 3 dB in each one-third octave band or be adjusted using the method described in AC36-4C (Appendix 3 of the Environmental Technical Manual on the use of Procedures

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in the Noise Certification of Aircraft (Doc 9501).

B36.4.4 Maximum tone corrected perceived noise level

B36.4.4.1 The maximum tone corrected perceived noise level, PNLTM, shall be the maximum calculated value of the tone corrected perceived noise level PNLT(k). It shall be calculated in accordance with the procedure of section B36.4.3. To obtain a satisfactory noise time history, measurements shall be made at 500 ms time intervals.

Note 1: Figure B36-2 is an example of a flyover noise time history where the maximum value is clearly indicated.

Note 2: In the absence of a tone correction factor, PNLTM would equal PNLM.

B36.4.4.2 After the value of PNLTM is obtained, the frequency band for the largest tone correction factor is identified for the two preceding and two succeeding 500 ms data samples. ~~**The following test shall be applied to these four samples**~~ **This is performed in order** to identify the possibility of tone suppression **at PNLTM** by one-third octave band sharing of that tone. ~~The frequency band of the maximum tone correction factor for the four samples is tested for a shift to lower frequencies (limited to three consecutive one-third octave bands) from the first to the fourth data sample.~~ If the value of the tone correction factor $C(k)$ for PNLTM is less than the average

where *T* is a normalizing time constant, PNLTM is the maximum value of PNLT, t(1) is the first point of time after which PNLT becomes greater than PNLTM-10 and t(2) is the point of time after which PNLT remains constantly less than PNLTM-10..

B36.4.5.2 Since PNLT is calculated from measured values of SPL, there will, in general, be no obvious equation for PNLT as a function of time. Consequently, the equation shall be rewritten with a summation sign instead of an integral sign as follows:

$$D = 10\log\left[\left(\frac{1}{T}\right)\sum_{k=0}^{d/\Delta t}\Delta t.\text{anti}\log\frac{\text{PNLT(k)}}{10}\right] - \text{PNLTM}$$

where Δt is the length of the equal increments of time for which PNLT(k) is calculated and d is the time interval to the nearest **0.5**s during which PNLT(k) remains greater or equal to PNLTM-10.

B36.4.5.3 To obtain a satisfactory history of the perceived noise level:

(a) Half-second time intervals for Δt, or

(b) A shorter time interval with approved limits and constants, shall be used.

B36.4.5.4 The following values for T and Δt shall be used in calculating D in the procedure given in section

B36.4.5.2:

T = 10 s, and

Δt = 0.5 s

Using the above values, the equation for D becomes:

$$D = 10\log\left[\sum_{k=0}^{2d} \text{anti}\log\frac{\text{PNLT(k)}}{10}\right] - \text{PNLTM} - 13$$

where ~~**the integer**~~ d is the duration time defined by the points corresponding to the values PNLTM-10.

B36.4.5.5 If in the procedures given in section B36.4.5.2, the limits of PNLTM-10 fall between the calculated PNLT(k) values (the usual case), the PNLT(k) values defining the limits of the duration interval shall be chosen from the PNLT(k) values closest to PNLTM-10. For those cases with more than one peak value of PNLT(k), the applicable limits must be chosen to yield the largest possible value for the duration time.

B36.4.6 Effective perceived noise level

B36.4.6.1 The total subjective effect of an Airplane noise event, designated effective perceived noise level, EPNL, shall be equal to the algebraic sum of the maximum value of the tone

(2) For propeller-driven airplanes: engine performance in terms of brake horsepower and residual thrust or equivalent shaft horsepower or engine torque and propeller rotational speed as determined from airplane instruments and manufacturer's data;

(i) Airplane flight path and ground speed during each demonstration; and

(j) Any airplane modifications or non-standard equipment **likely to affect noise characteristics of the airplane and** approved by the FAA. ~~as having equivalent noise characteristics.~~

B36.5.3 Reporting of noise certification reference conditions

B36.5.3.1 Airplane position and performance data and the noise measurements shall be corrected to the noise certification reference conditions as specified in the relevant sections of appendix C of part 36, and these conditions, including reference parameters, procedures and configurations shall be reported.

B36.5.4 Validity of results

B36.5.4.1 Three average reference EPNL values and their 90 per cent confidence limits shall be produced from the test

B36.5.4.3 The average EPNL figures obtained by the foregoing process shall be those by which the noise performance of the airplane is assessed against the noise certification criteria.

Section B36.6 Nomenclature: Symbols And Units

Symbol	*Unit*	*Meaning*
antilog	-	*Antilogarithm to the base 10.*
C(*k*)	dB	*Tone correction factor.* The factor to be added to PNL(*k*) to account for the presence of spectral irregularities such as tones at the k-th increment of time.
d	s	*Duration time.* The length of the significant noise time history being the time interval between the limits of *t*(1) and *t*(2) to the nearest **0.5** second.
D	dB	*Duration correction.* The factor to be added to PNLTM to account for the duration of the noise.
EPNL	EPNdB	*Effective perceived noise level.* The value of PNL adjusted for both the spectral irregularities and the duration of the noise. (The unit EPNdB is used instead of the unit dB).
f(*i*)	Hz	*Frequency.* The geometrical mean frequency for the *i*-th one-third octave band.
F(*i*,*k*)	dB	*Delta-dB.* The difference between the original sound pressure level and the final background sound pressure level in the *i*-th one-third octave band at the *k*-th interval of time.
h	dB	*dB-down.* The level to be subtracted from PNLTM that defines the duration of the noise.

(3) The take-off and approach reference procedures shall be those defined in paragraphs (b) and (c) of this section, respectively. ~~**For the purpose of defining the reference takeoff profiles for both takeoff and lateral noise measurements, the runway gradient is assumed to equal zero.**~~

(4) [Reserved]

(5) The reference procedures shall be calculated under the following reference ~~**atmospheric**~~ conditions:

(i) Sea level atmospheric pressure of 2116 psf (1013.25 hPa);

(ii) Ambient sea-level air temperature of 77°F (25°C, i.e. ISA+10°C);

(iii) Relative humidity of 70 per cent; and

(iv) Zero wind.

(i) For the purpose of defining the reference takeoff profiles for both takeoff and lateral noise measurements, the runway gradient is equal to zero.

Note: The reference atmosphere is homogeneous in terms of temperature and relative humidity when used for the calculation of atmospheric absorption coefficients.

(b) Take-off reference procedure:

(1) Take-off reference flight path shall be calculated as follows:

(i) Average engine take-off thrust or power shall be used from the start of take-off to the point where at least the following height above runway level is reached:

For Stage 1 airplanes and for Stage 2 airplanes that do not have turbojet engines with a bypass ratio of 2 or more, the following apply:

-- For airplanes with more than three turbojet engines--700 feet (214 meters).

-- For all other airplanes--1,000 feet (305 meters).

For Stage 2 airplanes that have turbojet engines with a bypass ratio of 2 or more and for Stage 3 airplane, the following apply:

-- For airplanes with more than three ~~**turbojet**~~ engines--689 feet (210 meters).

-- For airplanes with three ~~**turbojet**~~ engines--853 feet (260 meters).

-- For airplanes with fewer than three ~~**turbojet**~~ engines--984 feet (300 meters).

~~**-- For airplanes not powered by turbojet engines--1,000 feet (305 meters).**~~

(ii) Upon reaching the height specified in paragraph (b)(1)(i) of this section, the thrust or power shall not be reduced below that required to maintain:

(A) A climb gradient of 4 per cent; or

(B) In the case of multi-engine airplanes, level flight with one engine inoperative; whichever thrust or power is greater.

(iii) For the purpose of determining the lateral noise level, the reference flight path shall be calculated on the basis of using full take-off power throughout without a thrust or power reduction. However, for tests conducted on or before 19 March 2002, a single reference flight path that may include thrust cutback in accordance with paragraph (b)(1)(ii) of this section, shall be an acceptable alternative in determining the lateral noise level. The speed shall be the **all-engine operating take-off climb speed selected by the applicant for use in normal operation, which shall be at least V2+10kt (V2+19km/h) but not greater than V2+20kt (V2+37km/h) and which shall be attained as soon as practicable after lift-off and be maintained throughout the take-off noise certification test;** ~~minimum approved value of V2+10 knots (V2+19km/h), or the all-engines-operating speed at 35 feet (for turbine engine powered airplanes) or 50 feet (for reciprocating powered airplanes), whichever is greater as determined under the regulations constituting the type certification basis of the airplane~~. The speed shall be attained as soon as practicable after lift-off and be maintained throughout the take-off noise certification test. For Concorde airplanes, the test day speeds and the acoustic day reference speed must be the minimum approved value of V2 +35 knots, or the all-engines-operating speed at 35 feet, whichever speed is greater as determined under the regulations constituting the type certification basis of the airplane, except that the reference speed may not exceed 250 knots. Noise values measured at the test day speeds must be corrected to the acoustic day reference speed.

(v) A constant take-off configuration selected by the applicant shall be maintained throughout the take-off reference procedure except that the landing gear may be retracted. Configuration shall be interpreted as meaning the conditions of the systems and center of gravity position and shall include the position of lift augmentation devices used, whether the APU is operating, and whether air bleeds

and power off-takes are operating;

(vi) The weight of the airplane at the brake release shall be the maximum take-off weight at which the noise certification is requested, except as provided in § 36.1581(b) of this part; and

(vii) The average engine shall be defined by the average of all the certification compliant engines used during the airplane flight tests up to and during certification when operating to the limitations and procedures given in the Flight Manual. This will establish a technical standard including the relationship of thrust/power to control parameters (e.g. N1 or EPR). Noise measurements made during certification tests shall be corrected to this standard.

Note: Take-off thrust/power used shall be the maximum available for normal operations as scheduled in the performance section of the airplane flight manual for the reference atmospheric conditions given in section C36.7(a)(5).

(c) Approach reference procedure:

(1) The approach reference flight path shall be calculated as follows:

(i) The airplane shall be stabilized and following a 3° glide path;

(ii) **For subsonic airplanes, a steady approach speed that is either 1.23 V_{SR} (or 1.30V_S, whichever is applicable under the type certification basis of the airplane) + 10 knots (+19 k/h), or the speed used in establishing the approved landing distance under the airworthiness regulations constituting the type certification basis of the airplane, whichever speed is greatest, must be established and maintained over the approach measuring point.** ~~For subsonic airplanes a steady approach speed, that is either 1.30 Vs +10 knots or the speed used in establishing the approved landing distance under the airworthiness regulations constituting the type certification basis of the airplane, whichever speed is greatest, must be established and maintained over the approach measuring point.~~ For Concorde airplanes a steady approach speed, that is either the landing reference speed + 10 knots or the speed used in establishing the approved landing distance under the airworthiness regulations constituting the type certification basis of the airplane, whichever speed is greater, must be established and maintained over the approach measuring point.

(iii) The constant approach configuration as used in the airworthiness certification tests, but with the landing gear down, shall be maintained throughout the approach

reference procedure;

(iv) The weight of the airplane at the touchdown shall be the maximum landing weight permitted in the approach configuration defined in paragraph (c)(1)(iii) of this section at which noise certification is requested, except as provided in § 36.1581(d) of this part; and

(v) The most critical (that which produces the highest noise level) configuration with normal deployment of

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HELICOPTER HARMONIZATION NPRM STATUS

CONCEPT APPROVAL	**Sept '97**
TECHNICAL AGREEMENT	**July '97**
ARAC APPROVAL FOR DRAFTING	**Sept '97**
ARAC APPROVAL FOR ECONOMISTS/LEGAL SUPPORT	**Sept '97**
RECOMMENDATION TO ARAC	
All technical notes/papers/writeups furnished to FAA drafting services contractor	**10/20/97**
Drafting services contractor issues draft harmonization NPRM	**01/26/98**
HHWG co-chairs receive copy of 01/26/98 draft harmonization NRPM	**03/16/98**
Co-chairs' detail comments/answers/omitted text to drafting services contractor	**07/30/98**
Drafting services contractor's redraft of NPRM to HHWG members for comments	**10/06/98**
HHWG member comments due	**10/30/98**
Status of NPRM to ARAC Noise Certification Issues Group	**10/29/98**
Co-chairs incorporate member comments	**11/06/98**
NPRM changes/corrections to FAA drafting services contractor	**11/10/98**
Draft Final NPRM to HHWG members for approval	**12/01/98**
HHWG-approved Draft NPRM to ARAC Noise Certification Issues Group	**12/18/98**
RECOMMENDATION TO FAA	**1st Quarter '99**

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Attachment 65

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Aviation Rulemaking Advisory Committee Meeting on Noise Certification Issues

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of meeting.

SUMMARY: The FAA is issuing this notice to advise the public of a meeting of the Federal Aviation Administration Aviation Rulemaking Advisory Committee to discuss noise certification issues.

DATES: The meeting will be held on October 29 at 10:00 a.m.

ADDRESSES: The meeting will be held at the General Aviation Manufacturers Association, 1400 K Street NW, Washington, DC.

FOR FURTHER INFORMATION CONTACT: Ms. Angela O. Anderson, (202) 267–9681, Office of Rulemaking (ARM–200), 800 Independence Avenue, SW, Washington, DC 20591.

SUPPLEMENTARY INFORMATION: Pursuant to section 10(a)(2) of the Federal Advisory Committee Act (Pub. L. 92–463; 5 U.S.C. App. II), notice is hereby given of a meeting of the Aviation Rulemaking Advisory Committee (ARAC) to discuss noise certification issues. This meeting will be held October 29, 1998, at 10:00 a.m., at the General Aviation Manufacturers Association. The agenda for this meeting will include a progress report from the FAR/JAR Harmonization Working Group for Subsonic Transport Airplanes.

Attendance is open to the interested public but may be limited to the space available. The public must make arrangements in advance to present oral statements at the meeting or may present statements to the committee at any time. In addition, sign and oral interpretation can be made available at the meeting, as well as an assistive listening device, if requested 10 calendar days before the meeting. Arrangements may be made by contracting the person listed under the heading **FOR FURTHER INFORMATION CONTACT.**

Issused in Washington, DC, on October 7, 1998.

Paul Dykeman,

Assistance Executive Director for Noise Certification Issues, Aviation Rulemaking Advisory Committee.

[FR Doc. 98–27527 Filed 10–13–98; 8:45 am]

BILLING CODE 4910–13–M

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[4910-13]

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Issued in Washington, DC, on OCT 7 1998

Paul Dykeman

Assistant Executive Director for Noise Certification Issues, Aviation Rulemaking Advisory Committee